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10/530,263	06/06/2005	Toshihide Sekido	HIP-05-1080	4698

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IP GROUP OF DLA PIPER LLP (US)
ONE LIBERTY PLACE
1650 MARKET ST, SUITE 4900
PHILADELPHIA, PA 19103

EXAMINER	
SNELTING, ERIN LYNN	
ART UNIT	PAPER NUMBER
1741	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

pto.phil@dlapiper.com

Office Action Summary	Application No.	Applicant(s)	
	10/530,263	SEKIDO ET AL.	
	Examiner	Art Unit	
	Erin Snelting	1741	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 December 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16,19 and 21-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16,19 and 21-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Acknowledgement is made of amendment received 12-28-2010. Claim 16 is amended, and claims 1-15, 17-18, 20,and 28-36 are cancelled.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 16, 19, and 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sewell '478 (US 2005/0035478 A1) in view of Palmer '013 (US 4,942,013), Kimura '426 (JP 56-127426, English language translation provided previously), and Stewart '107 (US 2003/0227107 A1), and as evidenced by Mazumdar '02 (Mazumdar, Sanjay. "Chapter 7. Process Models" in: *Composites Manufacturing.* Boca Raton: CRC Press, 2002.).

5. Regarding claims 16 and 21, Sewell '478 teaches:

a. forming a reinforcing fiber substrate as a preform having a first fiber volume content, which is a volume of reinforcing fibers in the bulk volume of the reinforcing fiber substrate, ("body 22 having a plurality of fiber plies 24", paragraph [0014]; "A plurality of fiber plies...stacked to form a preform 138", paragraph [0020])

b. placing the reinforcing fiber substrate in a mold ("A plurality of fiber plies...are loaded into the mold cavity 110 and stacked to form a preform 138", paragraph [0020])

c. providing resin injection lines ("A resin source 120 containing a supply of resin is connected by tubing 122 to the resin inlet 116", paragraph [0018]) and evacuation lines each communicating with an inside of said mold ("a vacuum reservoir 124 is connected by tubing 126 to the vacuum port 118 so the resin source and vacuum reservoir are in fluid communication with the mold cavity 110", paragraph [0018]; "pump 132 is activated to pull a vacuum at resin inlet 116 and the vacuum outlet 118", paragraph [0021])

d. reducing pressure in said mold by evacuation ("The first pump valve 138, the vacuum valve 130, and the inlet valve 128 are opened, and the pump 132 is activated to draw a vacuum at the vacuum port 118", paragraph [0020])

e. injecting a resin into said mold ("...introduce resin into the mold cavity 110", paragraph [0020]) and impregnating the resin into said reinforcing fiber substrate to form said FRP molded material ("As the resin is introduced into the

mold cavity 110, the resin infuses in the preform 138 and intersperses between the reinforcing fibers of each ply loaded in the cavity to form the composite structure", paragraph [0020]) to achieve a fiber volume content lower than the target fiber volume content of the FRP molded material ("the vacuum applied to the mold cavity 110 forces the bladder 106 against the composite structure and thereby forces the composite structure against the tool surface 104", paragraph [0020]; "By removing excess resin, the above described mold produces composite structures that have a lower resin volume, a lower per ply thickness, and a high fiber volume", paragraph [0020])

f. stopping injection of the resin ("Once introduction and infusion of resin is complete, the first pump valve 138, the vacuum valve 130, and the inlet valve 128 are closed, and the pump 70 is deactivated, to terminate introduction of resin into the mold cavity 100", paragraph [0020])

g. thereafter, starting evacuation of the resin after the resin reaches the evacuation lines and continuing evacuation until a target fiber volume content is obtained ("To draw any excess resin away from the composite structure, the first pump valve 138, the second pump valve 142, the vacuum valve 130, and the inlet valve 138 are opened, and the pump 132 is activated to pull a vacuum at the resin inlet 116 and the vacuum outlet 118. The vacuum pulled at the inlet 116 and the outlet 118 draws excess resin away from the composite structure through the inlet 116 and outlet 118", paragraph [0021])

h. wherein, after said injection of resin is stopped, at least one line of resin injection lines is changed to an evacuation line ("The vacuum pulled at the inlet 116 and the outlet 118 draws excess resin away from the composite structure through the inlet 116 and outlet 118", paragraph [0021]), and said evacuation of resin is continued until reaching said target fiber volume content ("Once the composite structure is free of excess resin, it can then be removed from the mold cavity 110 and processed for ultimate use", paragraph [0021])

i. upon reaching the target fiber volume content, said evacuation of resin is stopped and then said reinforcing fiber substrate resin is cured ("Once the composite structure is free of excess resin, it can then be removed from the mold cavity 110 and processed for ultimate use. In some cases, the composite structure may be cured after being removed from the mold cavity 110", paragraph [0021] – wherein removal of the material from the mold implies a stopping of evacuation of resin).

Sewell '478 teaches reinforcing fiber layers (paragraphs [0014], [0020]), but is silent regarding the layers being bonded to each other. In analogous art of fiber reinforced composite manufacturing, Palmer '013 teaches forming a reinforcing fiber substrate, where reinforcing fiber layers are bonded to each other ("Such fiber reinforcement can either be stitched or non-stitched material, that is, it can be in the form of layers that are stitched together, as well as separate layers", column 6, lines 59-62). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Sewell '478 with the bonded layers of Palmer '013

as a simple substitution of reinforcing fiber substrate with the predictable result of forming a fiber reinforced composite.

While Sewell '478 teaches curing the resin in the reinforcing fiber substrate, it is silent regarding heating the substrate up to a resin curing temperature. In analogous art of fiber reinforced composite manufacturing, Kimura '426 teaches curing resin by heating a substrate up to a resin curing temperature ("the dies are heated for thermosetting, forming a fiber reinforced thermosetting resin molding", translation page 6, lines 22-23) for the benefit of bonding the fibers and resin together (see Sewell '478, paragraph [0021]). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Sewell '478 by curing the resin by heating the substrate up to a resin curing temperature, as taught by Kimura '426, for the benefit of bonding the fibers and resin together.

Sewell '478 is silent regarding a specific first fiber volume content of the reinforcing fiber substrate or the relationship of the first fiber volume content to the target fiber volume content. In analogous art of composite manufacturing, Stewart '107 teaches that a first fiber volume content of a reinforcing fiber substrate is a result effective variable because it may be altered in order to optimize resin flow behavior into the substrate (paragraph [0015]). It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. Please see In re Boesch, 617 F.2d 272, 205 USPQ (CCPA 1980). This is further evidenced by Mazumdar '02 which describes the influences of fiber spacing in the substrate, substrate geometry, and substrate permeability on resin flow behavior (see Section 7.4.2). Thus, it would

have been obvious to one of ordinary skill in the art at the time of the invention to optimize the first fiber volume content for the benefit of optimizing resin flow behavior into the substrate, and further to select a first fiber volume content that is not too high so as to cause poor resin impregnation. Regarding the target fiber volume content, Sewell '478 teaches that a high target fiber volume content is desirable for the benefit of increasing strength of the composite product (paragraph [0022]). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the first fiber volume content to be lower than the target fiber volume content for the benefit of ensuring good resin impregnation into the substrate and increasing strength of the composite product.

6. Regarding claim 19, Sewell '478 further teaches said target fiber volume content is in a range of 55 to 65% ("a volume of the plurality of reinforcing fibers comprises at least about sixty percent of a total volume of the composite structure body", paragraph [0007]).

7. Regarding claim 22, Sewell '478 teaches that a measurement of thickness of said reinforcing fiber substrate is used to determine fiber volume content ("By removing excess resin, the above described mold produces composite structures that have a lower resin volume, ***a lower per ply thickness***, and a high fiber volume", (emphasis added) paragraph [0022]). While Sewell '478 is silent regarding a specific manner in which reaching target fiber volume content is determined, it would have been obvious to one of ordinary skill in the art at the time of the invention that measuring target fiber

volume content requires a measurement of volume, wherein thickness is an obvious measurement for calculating volume, as suggested by Sewell '478.

8. Regarding claim 23, Sewell '478 further teaches that an injection amount of resin corresponding to the first fiber volume content is preset as an injection amount preset, and said injection of resin is stopped at the time said injection amount preset is reached ("Once the introduction and infusion of resin is complete, the first pump valve 138, the vacuum valve 130, and the inlet valve 128 are closed, and the pump 70 is deactivated, to terminate introduction of resin into the mold cavity 100", paragraph [0020] - wherein the injection amount preset is the amount or resin needed to complete introduction and infusion).

9. Regarding claim 24, Sewell '478 further teaches that an evacuation amount for reaching said target fiber volume content is preset, relative to an injection amount of resin as an evaluation amount preset and said evacuation of resin is stopped at the time said evacuation amount preset is reached (paragraph [0021] - wherein the evaluation amount preset is the amount of resin considered to be excess resin).

10. Regarding claim 25, Sewell '478 teaches reinforcing fiber substrate as described for claim 16 above. Sewell '478 is silent regarding at least one layer of said reinforcing fiber substrate comprising a carbon fiber layer. Kimura '426 teaches at least one layer of a reinforcing fiber substrate comprising a carbon fiber layer (translation page 4, lines 18-20) as a simple substitution of fiber substrate materials. Palmer '013 also teaches at least one layer of a reinforcing fiber substrate comprising a carbon fiber layer (column 6, lines 56-68) as a simple substitution of fiber substrate materials. It would have been

obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of Sewell '478, Palmer '013, Kimura '426, and Stewart '107 by substituting the carbon fiber layer of Kimura '426 or Palmer '013 in the reinforcing fiber substrate as a simple substitution of fiber substrate materials with a reasonable expectation of success for the predictable result of forming an FRP molded material.

11. Regarding claim 26, Sewell '478 is silent regarding a carbon fiber layer. Kimura '426 teaches carbon fiber layer as described for claim 25 above. Kimura '426 further teaches the carbon fiber layer is formed as a woven fabric (translation page 4, lines 18-21) for the benefit of obtaining desired reinforcing properties of the finished composite, and for optimizing ease of handling of the reinforcing fibers before resin impregnation (as opposed to loose fibers). Additionally, Palmer '013 teaches carbon fiber layer as described for claim 25 above, and further that the carbon fiber layer is formed as a woven fabric (column 6, lines 56-68) as a simple substitution of reinforcing fiber substrate. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of Sewell '478, Palmer '013, Kimura '426, and Stewart '107 further with the woven fabric of Kimura '426 for the benefit of obtaining desired reinforcing properties of the finished composite, and for optimizing ease of handling of the reinforcing fibers before resin impregnation, or with the woven fabric of Palmer '013 as a simple substitution of reinforcing fiber substrate with a predictable result of forming a fiber reinforced composite.

12. Regarding claim 27, Sewell '478 is silent regarding a woven fabric. Kimura '426 teaches woven fabric as described for claim 26 above. Kimura '426 further teaches

said woven fabric is formed as a unidirectional woven fabric ("isotropic", translation page 4, lines 18-21) for the benefit of obtaining desired directional reinforcing properties of the finished composite. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combined teachings of Sewell '478, Palmer '013, Kimura '426, and Stewart '107 further with the unidirectional woven fabric of Kimura '426 for the benefit of obtaining desired directional reinforcing properties of the finished composite.

Response to Arguments

13. Applicant's arguments filed 12-28-2010 have been fully considered but they are not persuasive. Arguments are summarized as follows:

a. There is no disclosure, teaching, or suggestion for making the Vf at an initial preform stage small relative to a target Vf.

b. There is no disclosure in the prior art of particles between the layers.

Response:

a. As described in the rejections above and previously, Stewart '107 suggests that a first fiber volume content is a result effective variable, such that optimizing this variable in any respect is considered to be within ordinary skill in the art, and such that too high of a first fiber volume content could cause poor resin impregnation. Regarding the target Vf, Sewell '478 clearly suggests that a high target fiber volume content is desirable for the benefit of increasing strength of the composite product. Thus, it is considered that such a relationship between

first fiber volume content and target Vf would have been obvious to one of ordinary skill in the art at the time of the invention.

b. It is noted that the features upon which applicant relies (i.e., "particles between the layers") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

14. Applicant's remaining arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin Snelting whose telephone number is (571) 272-7169. The examiner can normally be reached on Monday to Friday 9:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Daniels can be reached on (571) 272-2450. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

els

/Matthew J. Daniels/
Supervisory Patent Examiner, Art Unit 1741